SENSITIVITY ANALYSIS

Creating a software package that met the needs of the NCDOT Transportation Planning Branch required understanding the sensitivity of all variables used in planning analysis software. Sensitivity describes how much of an effect individual variables or factors have on the facilities' Level of Service (LOS). Many variables account for the changes in a facilities operation, such as number of lanes, lane width, grade, length of grade, free flow speed, g/C ratio, interchanges/mile, and number of access points, just to name a few.

Upon reviewing the 2000 HCM many variables and unknowns required further research to determine just how sensitive they really were. Because this analysis is crucial to the backbone of the software, the research team needed to determine default values that could appropriately reflect the type of roadway and its associated variables, thus giving the software user reasonable estimates with which to plan. Some sensitivity analysis was summarized from the 2000 HCM; however, the research team conducted the majority of the analysis for consistency with all types of variables used. The 2000 HCM gives adequate data with which to project default values for two lane highways, therefore, no further sensitivity research was needed on this type of facility.

The sensitivity analysis conducted by the research team was carried out using the 2000 Highway Capacity Software (HCS 2000©) developed by McTrans. HCS 2000© was used because it replicates the procedures within the HCM. Assumptions were made for each variable that was associated with a certain facility type. These assumptions were consistent with the assumptions made in the HCM. Graphically, sensitivity was measured using volume (veh/hr) as the independent variable and the facility's MOE as the dependent variable. By changing one, sometimes two variables (keeping other variables constant) at different volumes, we were able to record the level of service (LOS) at that specific point. The LOS was then plotted at the associated volumes for each variable(s) in question. These graphs showed the range effect for each variable, and thus we could determine the sensitivity of the variable.

Using the HCM documentation, combined with the sensitivity analysis of our research team using HCS 2000©, we were able to determine the sensitivity of a specific variable using three categories: low, medium, or high sensitivity. In short, a low sensitivity variable was one that did not affect the LOS of the facility type on a large scale, a medium one had some variation greater than ± one LOS, and a high sensitivity variable had a very large range throughout the LOS spectrum. Medium and high sensitivity variables were considered for further data collection to obtain good defaults for our planning purposes. Further explanation and graphical analyses of each facility type and the associated variables can be found in Appendix B. A summary of the findings for each variable and facility type is summarized in Table 7 below.